UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/867,892	05/30/2001	Rob Anne Beuker	TW 000002	7104

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EXAMINER
EDWARDS, PATRICK L

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 07/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
	09/867,892	BEUKER ET AL.
Office Action Summary	Examiner	Art Unit	
	Patrick L. Edwards	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

 A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
 after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
 Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
 earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>06 May 2005</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is

  closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-13</u> is/are pending in the application.

  4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-13</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

  Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

  Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

  a)☐ All b)☐ Some * c)☐ None of:

   1.☐ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____.

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage

    application from the International Bureau (PCT Rule 17.2(a)).

  * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
  Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
  Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

1.   The response received on 06 May 2005 has been placed in the file and was considered by the examiner. An action on the merits follows.

Response to Arguments

2.   The arguments filed on 06 May 2005 have been fully considered. A response to these arguments is provided below.

Prior Art Rejections

Summary of Argument:

A. Claim 11 stands rejected under 35 USC 102(e) as being anticipated by Lobregt et al. (6,078,699). Applicant alleges that Lobregt does not show all of the elements of independent claim 1, and therefore does not anticipate claim 11, which depends on claim 1.

B. Applicant presents the above argument in the context of the claim 6 apparatus.

C. With respect to claim 1, applicant alleges that Jasinschi does not teach the step of "translating the original coordinate system of the two images to substantially minimize average coordinate ranges of the 2D coordinates found." Specifically, applicant argues that Jasinschi "appears to teach a step of calibrating to realize a more stabile estimation of an essential matrix." (remarks, pg. 8).

D. Further referring to claim 1, applicant alleges that Nettles fails to teach the claim 1 limitation that it was brought in for. Applicant states that "applicants have carefully studies [sic] Nettles at col. 3 lines 21-37, and do not see that Nettles teaches determining parameters of the projective transformation as applicants [sic] step sets forth in detail, nor translating an original coordinate system prior to performing transformation, and then translating the coordinate system back to its original state so that the transformation cab [sic] be applies [sic] in the original non-translated coordinate system." (remarks, pg. 9).

E. Applicant alleges that there is no motivation to combine references in the claim 1 rejection (remarks, pg. 9).

Examiner's Response:

A. Applicant's arguments have been fully considered but are not persuasive. The examiner agrees that Lobregt does teach each and every feature of claim 1, but this is not pertinent to the anticipation of claim 11. Applicant is respectfully directed to the following excerpt from MPEP § 2114.

> *While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function. In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997).*

Claim 11 is drawn to an x-ray apparatus. Among other things, the apparatus comprises a "processor responsive to pairs of overlapping x-ray images obtained by the x-ray detector and configured to perform the method of claim 1." This limitation recites functional limitations, but fails to distinguish itself

structurally from the prior art. The examiner's interpretation of claim 11—specifically, the "processor" limitation—was expressly clarified in the previous office action. Lobregt discloses such a processor and thus anticipates the claim.

Again, applicant is respectfully invited to consult MPEP § 2114 for further information regarding the interpretation of apparatus claims.

B. See the above discussion on apparatus claims.

C. The examiner disagrees. Jasinschi discloses adjusting (i.e. translating) the original coordinate system to minimize coordinate ranges (i.e. put the spatial center of mass at (0,0) so that the ranges of all the points will be as small as possible.) of the 2D coordinates.

D. The examiner disagrees. Nettles discloses converting from a non-translated coordinate system (i.e. spherical coordinate sytem) into a translated coordinate system (i.e. cartesian coordinates). Nettles then performs a transformation in the translated coordinate system so that there is a true equivalence between the translated and non-translated projective transformations (i.e. the transformed data is converted back into spherical coordinates for display).

E. The examiner disagrees. Motivation was provided in the previous rejection and will be repeated in the below rejection.

Claim Rejections - 35 USC § 102

3.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4.   Claims 6 and 8-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Lobregt et al. (USPN 6,078,699).

With regard to claim 11, which is representative of claims 6 and 8, Lobregt discloses an x-ray source for projecting a beam of x-rays through an object to be examined, and an x-ray detector for obtaining digital x-ray images which are projections of the object (Lobregt col. 5 line 24 – col. 6 line 36 with Figure 1).

Lobregt further discloses a processor responsive to pairs of overlapping x-ray images obtained by the x-ray detector and configured to perform a method (Lobregt col. 4 line 58 – col. 5 line 5). The limitation regarding "the method of claim 1" recited in the claim is not given any patentable weight in this claim as it is simply reciting an intended use for the processor and does not further limit the claimed apparatus. It follows that the processor of

Lobregt could also be configured to perform the method of claim 1. The applicant is invited to consult chapter 2114 of the MPEP for further information regarding the interpretation of apparatus claims.

Lobregt further discloses a display for viewing the pair of images merged by the processor (Lobregt col. 6 lines 1-2 with Figure 1).

With regard to claim 9, Lobregt further discloses a network connection across which the images are received (Lobregt Figure 1). Referring to Figure 1, the connecting line between element 13 and element 20 is analogous to a network connection as recited in the claim in that the image processing system inherently receives the images via some sort of data transport mechanism (or 'network connection').

With regard to claim 10, computer processors inherently comprise a means for reading a computer-readable recording medium. Therefore, the processor disclosed in Lobregt inherently comprises a means for reading a computer readable medium.

With regard to claim 12, Lobregt further discloses means for jointly rotating the x-ray source and the x-ray detector about an axis (Lobregt col. 5 lines 27-32 in conjunction with Figure 1). The C-arm disclosed in Lobregt is analogous to the means for rotation about an axis as recited in the claim.

With regard to claim 13, a computer-readable recording medium that stores encoded program instructions which cause the computer to execute the steps of a method is essential if the image processing apparatus disclosed in Lobregt is to function. Therefore, a computer-readable recording medium is inherent in the Lobregt teachings.

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6.   Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lobregt as applied to claim 6 above, and further in view of Poulo et al. (USPN 6,535,650).

. Referring to claim 7, Lobregt discloses a means for obtaining a pair of 2D images, but fails to expressly disclose that this means comprises a digital camera. Poulo, however, discloses a digital camera for capturing a pair of 2D images (Poulo col. 2 lines 11-15). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Lobregt's image processing apparatus by using a digital camera as a means for obtaining images. Such a modification would have allowed for an an image processing apparatus which obtained images using a widely popular and ubiqitious means.

7.   Claims 1-3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz et al ("Multiframe Integration via the projective transformation with automated block matching feature point selection") in view of Jasinschi et al (USPN 6,504,569), and further in view of Nettles (USPN 5,430,806).

With regard to claim 1, the Schultz reference teaches a method for merging a pair of overlapping 2D images that are projections of a 3D scene. Schultz discloses selecting four feature points in the 3D scene and finding 2D coordinates (with respect to the original coordinate system of the two images) of the points in both images corresponding to the selected feature points (Schultz pg. 3266 left column, final paragraph). The variables, x_k and x'_k, disclosed in Schultz are analogous to the coordinates of the feature points in both images.

Schultz further discloses determining parameters of the projective transformation for application in original (non-translated) coordinate systems of the two images (Schultz pg. 3266 left column final paragraph) and merging the two images into a composite image by transforming one image according to the projective transformation into a transformed image and combining the transformed image with the other image (Schultz pg. 3266 right column step 7).

Schultz fails to expressly disclose the intermediate step of performing a translation of the original coordinate system of the two images to substantially minimize average coordinate ranges of the found 2D coordinates before determining the parameters of a substantially optimal projective transformation.

Jasinschi, however, teaches translating the original coordinate system of selected 2D feature points such that the average coordinate ranges of the feature points is substantially minimized (Jasinschi col. 6 lines 62-67). The step of coordinate calibration disclosed in the Jasinschi reference is analogous to the translation of the orignal coordinate system recited in the claim in that the average coordinate ranges are substantially minimized (i.e. the spatial center of mass of the feature points is approximately at the (0,0) coordinate origin).

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Schultz's image merging method by translating the coordinate system of the matched feature points before determing a projective transformation as taught by Jasinschi. Such a modification would have allowed for a more stable determination of the projective transformation (Jasinschi col. 6 line 67 – col. 7 line 1).

The Jasinschi reference fails to expressly disclose the step of altering the projective transformation parameters in the translated coordinate systems using translation vectors that ensure an equivalence of the projective transformation in the original and translated coordinate systems is true. This step implies that the projective transformation (which is computed using the translated coordinate system) is applied in the original, untranslated coordinate system (see applicant's specification paragraph [0059]). The Jasinschi reference, therefore, is deficient with respect to this limitation in that it discloses the translation of an original coordinate system before performing a transformation, but fails to expressly disclose that this tranformation is applied in the original coordinate sytem.

Nettles, however, discloses translating an original coordinate system prior to performing a transformation and then translating the coordinate system back to its original state so that the transformation can be applied in the original non-translated coordinate system (Nettles col. 3 lines 21-37), and therefore meets all the additional limitations of claim 1. It would have been obvious to one reasonably skilled in the art at the time of the invention to

modify Jasinschi's image processing method by translating the transformed image back into the original coordinate sytem as taught by Jasinschi. Such a modification would have allowed for viewing of the transformed image (Nettles col. 8 lines 14-21).

With regard to claim 2, Schultz further discloses automatic selection of feature points with sufficient surrounding structure for accurate matching of the corresponding 2D coordinates in the two images (Schultz pg 3266 left column final paragraph).

With regard to claim 3, Jasinschi further discloses that translating comprises determining the translation for each image as the average of the 2D coordinates in that image (Jasinschi col. 6 lines 62-67). Putting the coordinate origin at the spatial center of mass of the feature points as disclosed in Jasinschi is analogous to taking an average of the 2D coordinates as recited in the claim.

With regard to claim 5, Schultz discloses calculating a least squares solution for the projective transformation. A least squares solution as disclosed in Schultz qualifies as a function for minimizing error as recited in the claim.

8.   Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Schultz, Jasinschi and Nettles as applied to claim 1 above, and further in view of well known prior art.

With regard to claim 4, Schultz discloses determining the projective transformation parameters through the use of a matrix operation. Claim 4 recites determining these parameters by performing a singular value decomposition. Singular value decomposition is well known in the art (Official Notice) as a method for solving a matrix. It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Schultz's transformation parameter determination by specifying that the matrix operation was solved by a method of singular value decomposition. Such a modification would have allowed for a well known method of solving a matrix.

Conclusion

9.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10.	Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick L Edwards whose telephone number is (571) 272-7390. The examiner can normally be reached on 8:30am - 5:00pm M-F.
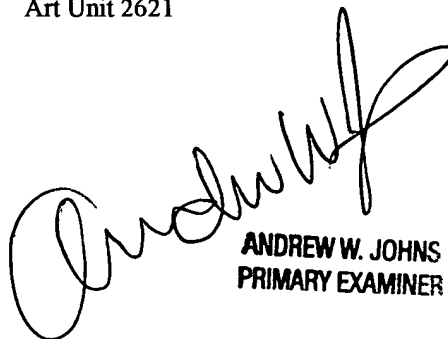
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joe Mancuso can be reached on (571) 272-7695. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patrick L Edwards   Art Unit 2621

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ANDREW W. JOHNS
PRIMARY EXAMINER